REMARKS

Claims 1-36, all the claims pending in the application, stand rejected on prior art grounds. This amendment is based in part on telephonic communications between the Examiner and the undersigned attorney on May 25-26, 2004, in which general consensus was reached on the amended claimed language for the purposes of allowance. Claims 1, 10, 24-28, and 30-36 are amended herein. Moreover, no new matter is presented. Applicants respectfully traverse the rejections based on the following discussion.

I. The Claim Rejections

Claims 1-36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al. (U.S. Patent Publication No. 2003/0106998), hereinafter referred to as "Colbert" in view of Requicha et al. (U.S. Patent No. 6,508,979), hereinafter referred to as "Requicha". Claims 15 and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert in view of Requicha, and further in view of Natan (U.S. Patent No. 6,025,202).

Colbert teaches macroscopically manipulable nanoscale devices made from nanotube assemblies. The article of manufacture comprises a macroscopic mounting element capable of being manipulated or observed in a macroscale environment, and a nanoscale nanotube assembly attached to the mounting element. The article permits macroscale information to be provided to or obtained from a nanoscale environment. A method for making a macroscopically manipulable nanoscale devices comprises the steps of (1) providing a nanotube-containing material; (2) preparing a nanotube assembly device having at least one carbon nanotube for attachment; and (3) attaching said nanotube assembly to a surface of a mounting element.

Requicha teaches a method for fabricating or prototyping a nanoscale object. The method

includes defining a sequence of nanolayers that represent the nanoscale obje t, constructing a current nanolayer on a first surface, and depositing a sacrificial layer to cover the first surface but not the nanolayer. The nanolayer represents a slice of the nanoscale object. The nanolayer and the sacrificial layer provide a second surface on which a next nanolayer is constructed. The above construction and deposition steps are repeated if the next nanolayer is not the last nanolayer. The method also includes removing the sacrificial layers to produce the nanoscale object.

Natan teaches a biosensor based on complexes between biomolecule receptors and colloidal Au nanoparticles, and more specifically, colloid layers of receptor/Au complexes that can be used to detect biomolecule analytes through measuring of binding-induced changes in electrical resistance or surface plasmon resonance. Also disclosed is a method for detecting and analysing carrier-borne chemical compounds with Raman spectroscopy using an improved SERS substrate. Further disclosed is an improved method for detecting compounds in solvents using capillary electrophoresis in conjunction with Raman spectroscopy.

However, the amended claimed invention teaches aspects not taught or suggested by any of the prior art references alone or in combination with one another. Specifically, the prior art references do not teach or suggest that "...each of said nanoparticles comprising a mean diameter, wherein a variability in a diameter of each of said nanoparticles is less than 15% of said mean diameter," as recited in amended independent claim 1, and similarly recited in claims 10 and 24-28. More specifically, this aspect of the invention provides for a clear distinction between the nanotubes of Colbert and the nanoparticles of the claimed invention. That is, the structural differences between Colbert's long and skinny nanotubes are the claimed invention's non-tube like nanoparticles are provided in the amended claimed language.

As discussed above Colbert discloses a method for producing "macroscopically manipulable nanoscale devices made form nanotube assemblies." The Colbert reference further describes methods to attach carbon nanotubes (either a single one or small bunches) to the ends of an SPM tip. However, Colbert specifically limits the invention to carbon nanotubes, which are long 1-dimensional objects. The differing aims of the two inventions (Colbert and the claimed invention) are reflected in their different respective geometries. Colbert uses nanotubes; i.e., quasi 1-dimensional objects, whereas the claimed invention uses nanoparticles; i.e., quasi 0-dimensional objects. Moreover, nanotubes are particularly suited for interacting with objects with high aspect-ratio. However, due to their extended geometry, the tips are susceptible to thermal fluctuations and breakage. Furthermore, it is difficult to align nanotubes so that they protrude from the tip in the desired direction. An additional drawback of nanotube tips is that it is difficult to prevent multiple tips from forming on the same probe.

In contrast, nanoparticle tips as provided by the claimed invention, do not suffer from the thermal fluctuations, fragility, alignment problems, and difficulties with multiple tips associated with nanotube tips. A coating of nanoparticles conforms to the shape of the underlying substrate, and thus does not substantially change the geometry.

Additionally, the claimed method for attaching nanoparticles to SPM tips differs in significant, unobvious ways from the method of Colbert, Requicha, and Natan, wherein Colbert merely discloses a method for attaching nanotubes to SPM tips. Most significantly, Colbert only discusses attaching nanotubes to tips by moving an SPM tip into a solid mass of nanotube-containing material. There is no mention in Colbert of depositing nanotubes onto SPM tips via immersion in a solution. This is yet another distinction between the claimed invention and Colbert, wherein the method provided by the claimed invention deposits the nanoparticles from a

fluid state, whereas Colbert makes a solution of nanotubes as an intermediate step in their process, but then deposits the nanotubes onto the tip from a dry state.

Deposition directly from a fluid state has several advantages. For example, (a) the nanoparticles may equilibrate to form a highly ordered array on the tip; (b) the process does not involve solid-solid contact, so there is a smaller chance of damaging the tip; (c) deposition from a fluid can be performed in a parallel manner on an entire wafer of tips. In contrast, dry deposition of nanotube tips must be done one-by one; (d) chemical modifications may be performed in-situ to attach the nanoparticles to the tip. Additionally, due to the low solubility of nanotubes, it would not be practical to deposit them directly from a solution. Thus, the Applicants assert that deposition from a solution is not an obvious extension of Colbert because such a deposition only works with nanoparticles, and not with nanotubes.

The Office Action further asserts that the claimed invention is an obvious combination of Colbert and Requicha. However, the Applicants respectfully disagree. There is no discussion anywhere in Colbert of attaching other types of materials to SPM tips, and certainly no mention or disclosure of method for attaching 0-dimensional nanoparticles (either single nanoparticles, or layers of nanoparticles) having a reduced variability in its diameter size, which is provided by the claimed invention.

Furthermore, the method of Colbert relies critically on specific preparation of "nanotube-containing material" [see paragraph [0048] of Colbert]. Following the technique of Colbert, it is important to prepare the raw nanotube-containing material such that some nanotubes project out from the surface. Colbert calls these nanotubes "outliers," and give specific instructions for how to prepare samples containing such outliers (see paragraph [0048] of Colbert). This is a critical step in the invention of Colbert. Similar preparation of such "outliers" is not practical and

simply does not make sense in the method of the claimed invention, because the claimed invention attaches 0-dimensional nanoparticles to SPM tips. As such, it is impossible for such 0-dimensional objects to become "outliers" in that they cannot be drawn out of the surface of the material because they are not long and 1-dimensional structures as are nanotubes.

Furthermore, Requicha does not describe any method for applying these nanolayers of nanoparticles onto the surface of an SPM tip. Again, the method of Colbert cannot be obviously applied to the nanolayers described by Requicha because there is no disclosed method for attaching the nanoparticles onto the SPM tip. Colbert's method (of producing outliers, etc.) cannot work for 0-dimensional nanoparticles, and Requicha's invention offers no discussion of applying materials to SPM tips.

Furthermore, the Office Action cites that Colbert discloses dipping the tip into a layer of nanotubes (paragraph [0053] of Colbert), which reads, in part: "Once...contact between the sample and the mounting device has been made, the mounting device is translated in a direction away from the nanotube layer." As previously discussed, the layer of nanotubes described in Colbert is a solid nanotube-containing layer which has been prepared in a specific way to produce what Colbert calls "outliers." (see paragraph [0048] of Colbert). Conversely, the claimed invention specifically discloses dipping SPM tips into nanoparticles layers in a solution.

Regarding claim 3, the Office Action claims that Colbert discloses the use of catalytic nanoparticles in mixtures for producing nanoparticles (paragraphs [0162] and [0180] of Colbert). While nanoparticles are often used to catalyze the reactive growth of carbon nanotubes, there is no teaching in Colbert of attaching these catalyst nanoparticles to the tip of an SPM. Rather, in Colbert, the emphasis is on growing nanotubes in a bulk form (using catalysts), creating a "nanotube containing material" by very specifically-detailed means (see paragraph [0048] of

Colbert), and subsequently attaching said nanotubes to SPM tips.

Regarding claims 4-6, the Office Action cites Colbert as using organic coatings and adhesive coatings (paragraphs [0055]-[0059] in Colbert). In Colbert these organic coatings are used as the glue with which the nanotube is attached to the SPM tip. Conversely, in the claimed invention it is the nanoparticles themselves which are coated with the organic surfactant, which in this case acts as a stabilizer to prevent nanoparticles aggregation. In addition to differences in structure (in the claimed invention, organic layer is applied to nanoparticles. In Colbert, the organic layer is applied to SPM tip), the function of the organic layer in the two inventions is different.

Regarding claims11-14, 19, and 20, the Office Action cites that Colbert discloses dipping the SPM tip into solution (see paragraphs [0056]-[0057] of Colbert). Colbert describes dipping the SPM tip into a solution of the organic glue, as one method of coating the SPM tip with glue in order to facilitate attachment of carbon nanotubes. In Colbert, the organic glue does not contain the nanotubes. Conversely, the claimed invention provides for something entirely different, wherein the SPM tip is dipped into a liquid containing nanoparticles (no glue), which is deposited onto said SPM tip directly from the solution.

Regarding claims 22 and 23, the Office Action cites Colbert in view of Requicha, except for the use of annealing to make an electrically continuous film. The Office Action cites obviousness. However, there is no mention in Colbert of any method of annealing the SPM tip once the nanotube has been attached in order to make a film more conducting. In Colbert's case this is impractical and quite simply just does not make sense because the nanotube is already conducting prior to attachment to the tip, whereas a film of nanoparticles is not. Annealing to facilitate conductivity only makes sense in the claimed invention, not in Colbert.

Regarding claims 30-36, the Office Action cites that Requicha discloses spherical nanoparticles in Column 2, line 40-49. However, in Column 2, lines 31-44 of Requicha, it is indicated that the nanoparticles are not formed on the tip itself; rather the nanoparticles are manipulated (referred to in Requicha as nanomanipulation), which "includes pushing and/or pulling of the nanoparticles...with the tip of the SPM to the desired locations." Thus, the nanoparticles of Requicha are not attached in any way to the SPM tip, they are simply pushed and pulled by the tip. Thus, even if spherical nanoparticles are disclosed in Requicha, when amended claims 30-36 are read in light of the amended independent claims from which they depend, respectively, then Requicha fails to teach the claimed invention.

Regarding claims 15 and 19, the Office Action cites Colbert, in view of Requicha, and in further view on Natan, stating that although Colbert in view of Requicha does not disclose the use of spherical nanoparticles. The Applicants believe this to be an inadvertent mistype as the Office Action previously states that Requicha discloses spherical nanoparticles in Column 2, line 40-49. As such, the Applicants believe that the Office Action meant to say that Colbert, in view of Requicha, and in further in view of Natan teaches claims 15 and 19. The Office Action suggests that Natan's invention discloses a layer of colloidal Au deposited on a substrate. While Natan describes Au colloidal deposition onto a substrate, Natan does not, however, describe the substrate as being an SPM tip (substrates are always referred to as "glass slides," since this is the preferred substrate for Natan's invention). In fact, there is no indication in Natan of deposition of Au colloids onto SPM tips using any of the methods described in the claimed invention. As previously discussed, it is not obvious to combine Au colloidal deposition into a substrate (Natan) with the method used for 1-dimensional nanotube attachment described in Colbert. Again, the two materials (nanotubes vs. nanoparticles) are fundamentally geometrically different.

Clearly the invention is part of a crowded art field. As such, given the crowdedness of the art, the novel aspects of the invention should be regarded as a significant step forward in the constant development of this technical art field.

In view of the foregoing, the Applicants respectfully submit that the collective cited prior art do not teach or suggest the features defined by amended independent claims 1, 10, and 24-28 and as such, claims 1, 10, and 24-28 are patentable over Colbert alone or in combination with Requicha and/or Natan. Further, dependent claims 2-9, 11-23, and 29-36 are similarly patentable over Colbert alone or in combination with Requicha and/or Natan, not only by virtue of their dependency from patentable independent claims, respectively, but also by virtue of the additional features of the invention they define. Thus, the Applicants respectfully request that these rejections be reconsidered and withdrawn.

Moreover, the Applicants note that all claims are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

II. Formal Matters and Conclusion

In view of the foregoing, the Applicants submit that claims 1-36, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Furthermore, no new matter is presented. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any

overpayments to Attorney's Deposit Account Number 50-0510.

Respectfully submitted,

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